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USDA
FOREST SERVICE
NORTH CENTRAL
FOREST EXPERIMENT
STATION

OUR STRATEGY FOR THE 1990's



NORTH CENTRAL
FOREST
EXPERIMENT STATION

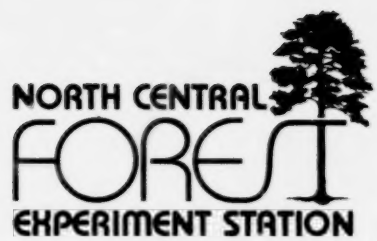


United States
Department of
Agriculture

PREPARED By
Forest Service

North Central Forest
Experiment Station

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To Station Employees

In April 1989, a small group of Station employees met in Two Harbors, Minnesota, to begin developing a bold strategy for the Station to move forward through the 1990's. The resulting strategic plan will provide a cornerstone to help us shape our research program, in concert with the national Forest Service Research program.

As this plan developed, a few key messages came to me:

We can influence our future in a complex, changing environment. Although opportunities and uncertainties will abound in the years ahead, I am convinced that we, together with our cooperators and clients, can influence the shape of our future.

The 1990's will be the decade of the environment. The 1990's will bring increasing cries for environmental protection; concern about air, water, wildlife and fish, scenery, and recreational opportunities; and general concern about human health are mounting. We must strive through our research to learn about both the biological processes and the socio-economic aspects of natural resource management.

We need the individual energy, commitment, and involvement of each North Central Station employee. The participation of all 300 employees will be required to carry out our plan and enable us to remain the leading provider of natural resource research in the North Central Region.

I believe we have an excellent plan which will serve us well as we meet the challenges of the future. I hope this plan provides you, the Station employee, with a focus for the future and that it gives you the message that our work does make a difference.

Ronald D. Lindmark

R. D. Lindmark

Director



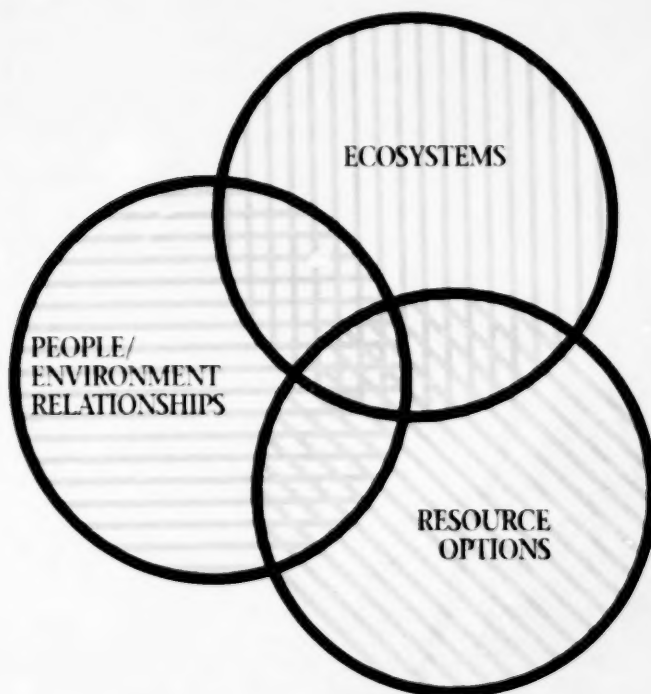
EXECUTIVE SUMMARY

Our strategic plan puts forth an ambitious agenda for the 1990's. It describes our mission, goals, and strengths and our research strategy. Our ability to carry out this plan depends on the talents, creativity, and initiative of all our employees, as well as on the combined efforts of our research users and cooperators in the natural resource community.

Our mission is to create, evaluate, and disseminate information and technology to improve management and use of our natural resources. As a new generation of forests emerges in the North Central United States, managers face two unique challenges: dealing with the great diversity in composition, quality, and ownership of the forests, and reconciling the conflicting demands of people who use them. We are dedicated to helping forest managers meet these challenges with the highest quality research results.

Our region is exceptionally diverse in forest types, landform, land ownership, and human population. Its prairie-hardwood-boreal forest transition zones are unique. Its Great Lakes and other abundant freshwater lakes and streams are unequalled in the Nation. One of this country's largest urban concentrations is found in our region. And, more State and county land holdings are here than in any other region.

Three interrelated categories define our research strategy:



UNDERSTANDING ECOSYSTEMS

Research on the basic function of forest ecosystems will provide the basis for understanding and dealing with the many environmental concerns of the 1990's. Our research focuses on the underlying characteristics of individual ecosystem components such as plants, animals, water, soil, and air as well as on the interdependency among these components. Our major research thrusts focus on understanding

- biological principles of forest growth,
- forest health,
- biological diversity, and
- land/water interactions.

UNDERSTANDING PEOPLE/ ENVIRONMENT RELATIONSHIPS

Our Station will continue research to understand the values people place on the forest environment. This growing emphasis area includes research to identify perceptions and preferences people have for their outdoor experiences and for forest resources such as scenery and wildlife. Also, concern about the safety of homeowners living in woodland settings has prompted us to begin research on the assessment and management of wildfire hazards in the wildland/urban interface. In addition, we can make unique contributions to science as the only Forest Service research station evaluating the economic and social impacts of applied forestry research. Our major research thrusts in this area focus on:

- people/forest interactions, and
- research evaluation.

UNDERSTANDING RESOURCE OPTIONS

This area of research will blend our knowledge of ecosystems and people/environment relationships to determine what effects management actions have on ecosystem productivity. We will develop new decision support systems for resource managers that incorporate our most recent research results. Research will be conducted on all the different forest resources as well as in some important areas such as forest inventory and analysis, environmentally sensitive harvesting systems, stand dynamics, and the economics of long-term forest management. Our researchers from different disciplines will work together closely to produce research information that will truly assist forest managers with integrated resource management. Our major research thrusts in this area include:

- conducting inventory and analysis,
- sustaining forest productivity, and
- integrating resource uses.

MISSION

As we carry out our mission, we will strive to anticipate and address the major research information needs of forest managers, policy makers, and users in the future. With that objective, we will work to produce and communicate research of the highest quality.

Since 1923 the North Central Forest Experiment Station has been the leading Federal agency for natural resource research in the Midwest.

We are 300 people dedicated to producing quality research that is regional, national, and international in scope.

Our mission is to create, evaluate, and disseminate information and technology to improve management and use of our natural resources.

As a new generation of forests emerges in the North Central United States, managers face two unique challenges: dealing with the great diversity in composition, quality, and ownership of the forests, and reconciling the conflicting demands of people who use them. We are dedicated to helping forest managers meet these challenges with the highest quality research results.

Our achievements will be proportional to the technical excellence, innovation, and dedication of our employees. We, therefore, are determined to provide a working climate that will enhance their efforts.

Our success results from our work with others, including industry, universities, other government agencies, and private groups and individuals. We are committed to promoting effective working relations with our partners in the natural resource community.

- ▲ Experimental Forests
- Field Station
- ★ Station Headquarters



*Additional state responsibilities for
Resource Evaluation (Forest Survey)*

GOALS

As we carry out our mission, we are pursuing two major goals:

- to anticipate and address the major research information needs of forest managers, policy makers, and users in the future, and
- to produce and communicate research of the highest quality.

Additional goals critical in achieving the first two are:

- to provide an environment that encourages the development and retention of a technically and culturally diverse, talented, conscientious, and dedicated work force,
- to strengthen our partnerships and cooperative ventures,
- to build solid relationships with our research clients, and
- to create opportunities to improve our research facilities and equipment.

BUILDING ON STRENGTHS

Our strategy for the future builds on the strengths of the North Central Station and the unique characteristics of our region.

Setting - Our region is uniquely diverse in forest types, landform, land ownership, and human population. Its prairie-hardwood-boreal forest transition zones are unique. Its Great Lakes and other abundant freshwater lakes and streams are unequalled in the Nation. One of this country's largest urban concentrations is found in our region. And, more State and county land holdings are found here than in any other region.

Continuity - For some research questions there is no substitute for long-term data. Baseline studies maintained on our 14 Experimental Forests and more than 20 Research Natural Areas have provided continuous data and information for the past 50 years. Information from these and other studies allows our scientists to respond to emerging resource issues such as global change, as well as to validate projections of future growth and development of forests.

Cooperators - Our partnerships with universities and other research institutions, industries, interest groups, state departments of natural resources, and our associates in the Forest Service - Northeastern Area State and Private Forestry and the National Forest System - are invaluable to us as we focus and conduct research. Three-quarters of the National Forests in the northeastern US are in our Station territory. These and forests on private, industrial, and other public land represent excellent outdoor laboratories for our studies.

People - Station employees are talented, innovative, hard working, and conscientious. Our tremendous diversity of scientific and technical

TRENDS

expertise enables us to adjust our program to quickly respond to changing research needs. Our administrative personnel uses creativity and efficient operating procedures to make sure our job gets done.

We must anticipate research needs rather than react to crises. To do this, we must be aware of coming trends. For the 1990's, we see the following major trends affecting natural resources and thus influencing the direction of our research program.

Resource Use Changes - A movement is on, largely driven by a shift in population, to increase the productivity of non-timber values and resources such as recreation, scenery, water, fish and wildlife. At the same time, forests in the North Central Region are facing rising pressure for increased wood products.

Environmental Health Changes - The public has a growing understanding and concern about human health, the environment, and adverse effects on natural systems. Increasingly, they worry about how atmospheric changes, fire and pests, and silvicultural practices affect forests.

Technological Changes - High technology, such as geographic information systems, biotechnology, and artificial intelligence, is being used more and more by scientists and forest managers alike. These advances accelerate change in forestry.

SHAPING OUR RESEARCH PROGRAM

Our challenge is to shape a research program that balances the need to respond to emerging issues with our commitment to long-term research studies. With each new research opportunity, we face trade-offs between new and existing programs. In setting priorities and determining research direction, we will look at how our total research program can make the greatest contribution to science and forest management.

But we do not make these decisions in a vacuum. Decisions about the research we do depend on many factors that are constantly changing. Some key factors include (1) the information needs of our research users. Such needs change as our natural resources and our understanding of the best way to manage those resources constantly change. (2) Our employees' skills and our facilities and equipment, and those of our cooperators, affect our research direction. And, (3) political forces determine our funding and demand that our program be flexible.

PROGRAM FOR THE 1990's

Understanding Ecosystems



Research Thrust 1: BIOLOGICAL PROCESSES Understanding the biological principles of forest growth.

RESEARCH APPROACH

Three interrelated categories define our research strategy for the 1990's - Understanding Ecosystems, Understanding People/Environment Relationships, and Understanding Resource Options.

Within each of these three broad categories of research are several research thrusts.

Research on the basic function of forest ecosystems will provide the basis for understanding and dealing with the many environmental concerns of the 1990's. Our research focuses on the underlying characteristics of individual ecosystem components such as plants, animals, water, soil, and air in forests in the North Central States, as well as on the interdependency among the components. Our major research thrusts focus on understanding:

- biological principles of forest growth,
- effects of global change and other environmental stresses on forest ecosystems,
- preservation of plant and animal diversity, and
- factors influencing quality and quantity of aquatic habitat.

Understanding the biological principles of tree and forest growth is the first step toward developing practical forest management strategies. Silvicultural researchers need fundamental knowledge of ecology, physiology, and genetics to make progress toward solving practical problems that forest managers face. This fundamental knowledge of how and why trees grow as they do is used to understand how forest management and environmental stresses affect forest growth. Researchers seek this basic understanding by asking questions such as: How do changing environments affect photosynthesis and respiration in forest trees? How do human-caused changes affect the genetic makeup of a forest? Why does air pollution limit tree growth? We recognize that science will never fully understand all the myriad processes of nature, but research on biological processes in trees and forests is an important step toward that understanding.

Current - Traditionally, we have focused this research thrust on basic processes, believing that a strong scientific foundation will make it possible for us to respond to future resource and environmental problems. This program includes tree physiology - the biological processes that influence the establishment and early growth of forests, principles of seed production and dispersal and their effects on regeneration, and genetics - how forests are genetically affected by environmental and human-caused stresses.

Future - Our research in this area will remain strong in the 1990's. The long-term nature of many of our questions requires a research pro-

**Research Thrust 2:
FOREST HEALTH
Understanding global
change and other
environmental stresses
on forests.**

RESEARCH APPROACH

gram with continuity. As we move into the future, we will place greater emphasis on translating knowledge from laboratory studies into field studies. Also, research will be strengthened in some areas to determine how the underlying principles of forest growth differ under environmental stress. This focus is the bridge to our research on forest health and is also the foundation of our work to increase forest productivity.

America has a new environmental consciousness. Citizens are concerned that environmental stresses such as insects and diseases, wild-fire, drought, air pollution, and human exploitation are threatening the health of our forests. And, recent studies show that changes in global climate may increase the environmental stresses forests experience. Projected increases in global temperatures and changing rainfall patterns could alter vegetative growth, affect species migration and adaptation, accelerate nutrient cycling, and increase moisture stress. Plant and animal competitive relationships could be disrupted, and the composition of plant communities would change. These climatic changes may also increase fire frequency and intensity and the activity of many insects and diseases. More than ever, land managers need to be able to predict, monitor, and lessen the impact of environmental stresses in caring for the Nation's forests.

Current - Our research program includes many unique areas of study on the effects of environmental stresses on forest ecosystems in the North Central Region. Currently it includes research on forest and lake responses to acid deposition, on the interrelations between drought stress and insect and disease attacks on forests, and on large wildland fires and wildfire behavior. Biotechnology and other techniques help us to develop forests that are more tolerant of environmental stresses. Overall, we study stress effects on ecosystems at scales that range from the basic physiological processes of individual plants to large-scale landscapes.

Future - Our region includes two unique transition zones - prairie/forest and hardwood/boreal forest - in which we can study the effects of environmental stresses on plant community composition and species migration. Our studies will prompt such research questions as: How does the changing climate affect the diversity of plant and animal species? What are the cumulative effects of global change and acidic deposition on water quality and quantity? What is the relation between atmospheric change projections and potential wildland fire activity? How do trees and damaging agents interact under global change conditions? An important part of this research thrust will be monitoring forest health.

As we learn the answers to these questions, we will work with land managers to develop strategies they can use to both manage the

forest changes brought on by environmental stresses and to influence global change through modified forestry practices

**Research Thrust 3:
BIOLOGICAL DIVERSITY**
Learning how to manage
forests to preserve and
increase distribution and
abundance of many
species.

The accelerating loss of species diversity on a global scale is cause for concern. Our Nation has recognized this concern in proposed legislation that makes conserving and enhancing biological diversity a national goal. At present, however, the Forest Service is the only Federal agency with a specific legislative mandate (National Forest Management Act, 1976) to conserve biological diversity. The large land base we manage provides a unique opportunity for the Forest Service to respond to this mandate and to provide leadership.

The land ownership patterns in the Eastern United States present a particular challenge in managing for biological diversity. Because most land here is in small blocks held by private owners, large tracts of public lands are increasingly viewed as important reservoirs of diversity. The opportunity to manage relatively large blocks of forested landscapes in the East is almost unique to the Forest Service. With this opportunity comes the responsibility of considering how information about ecological interactions and processes at various scales might allow us to better manage these public resources.

RESEARCH APPROACH

Current and Future - North Central Station researchers and forest managers are working together to develop concepts and practical tools for measuring diversity and evaluating the impact of management on diversity. Our newly established research program in this area will help forest managers understand the relation between plant and animal diversity and differing landscape patterns. It will also help determine the amount and distribution of habitat needed to maintain viable populations, especially for those species that are rare, endangered, or potentially threatened. Specific areas of research deal with such things as ecological processes within old growth forests in the East, the role of landscape patterns created through forest harvest or other land uses in providing biological diversity, and a landscape approach to biodiversity that uses geographic information systems and forest succession models. With information from these studies, managers will be better able to predict the fate of plants and animals in managed environments.

**Research Thrust 4:
LAND/WATER
INTERACTIONS**
Identifying factors that
influence the quality and
quantity of aquatic
habitat on forest land.

Forests of the northern Lake States occupy a landscape characterized by a rich mosaic of upland, lowland, and aquatic ecosystems. These ecosystems are inextricably linked by water, arriving as rain and snow and flowing from uplands through wetlands to lakes and streams. In addition to its more mundane uses for municipal and industrial purposes, water in its many forms - marshes, bogs, lakes, ponds, and snow - attracts vacationers and northwoods residents for enjoyment.

The use and management of the northern Lake States forests, the occurrence of acidic rain and snow and other pollutants, and the physical and chemical characteristics of the various landforms determine the quantity and quality of the water that is so vital to the economy and the way of life in this part of the country.

Natural resource professionals strive for wise management of Lake States forests, environmentally sound treatment and disposal of sewage and other waste products, protection of delicate aquatic and riparian habitat, maintenance of natural water flows, and preservation or improvement of water quality. These goals all require an understanding of water movement and other hydrologic principles, soil and water chemistry, and ecological relations that influence aquatic resources.

RESEARCH APPROACH

Current - Through our forest watershed research, we are working to understand how ecosystems are affected by forest management practices and by atmospheric phenomena such as global change and acidic precipitation. Fisheries research focuses on the ecological relations between fish and their habitats by looking at populations, communities, and ecosystems. This research thrust will help land managers identify critical areas of aquatic, wetland, and riparian habitat, and will help set priorities for their management and use.

Future - In the 1990's we will expand our research on the effects of global change on the water resource, focusing on the cumulative effects of land management practices on water yields and quality with increasing carbon dioxide, continuing high levels of acid rain, and global changes in temperature and moisture patterns. We will also begin to evaluate the "Best Management Practices" guidelines being developed by states under the Clean Water Act for practices such as peatland drainage, site preparation, herbicide and fertilizer use, and forest harvesting. In addition, we will expand our fisheries research, looking especially at how land management affects the critical elements of sedimentation and large woody debris.

Understanding People/ Environment Relationships



**Research Thrust 1:
PEOPLE/FOREST
INTERACTIONS**
Understanding the value
people place on forest
environments.

RESEARCH APPROACH

Our Station will continue research to learn how people value the environment. This growing emphasis area includes research to identify people's perceptions and preferences for outdoor experiences and for forest resources such as scenic beauty and wildlife. Also, concern about the safety of homeowners living in woodland settings is prompting us to begin research on the assessment and management of wild-fire hazards in the wildland/urban interface. With this research, forest managers will be better able to protect and serve the people and the resource. In addition, we are doing research on research - evaluating the economic and social impacts of applied forestry research.

The North Central Station territory includes one of our Nation's largest urban concentrations - home to forest users of varied racial and ethnic backgrounds. Many other forest users live in rural farm and forest communities, and include those who depend on the resources of the forest for their livelihood. The forest environments that are important to these people span from backyards, streets, and parks in the city to extensive areas of wilderness far removed from centers of population.

People live and recreate in forest environments. These experiences shape their preferences and values, and help them establish their own environmental ethic. People build permanent and seasonal homes in scenic wildland settings as a way to escape the daily stress of commuting and work. The forest landscape is a visual backdrop for most outdoor activities, including Sunday drives, a day watching birds, a canoe excursion, or a hunting trip. The growing flow of people to forest environments increases the risk of wildfires and the potential loss of human life, property, and natural resources. Today, the North Central region has about 60,000 wildfires per year - one-third of the Nation's total. And, increasingly, Americans want to have a say in decisions about how forests are conserved. Their involvement in the National Forest planning process and in policy issues such as forest harvesting and biodiversity clearly demonstrates that.

Current - We can manage this region's diverse forest environments to serve and protect the people and the resource only if we understand people's values and needs for their outdoor experiences. Today our research works to identify the perceptions, preferences, needs, and values of individuals. Our current goal is to apply that information to help managers predict how people are likely to respond to changes in the environment and associated management activities.

Future - This research program area will be given increased emphasis in the 1990's. We will continue to develop methods to identify the

**Research Thrust 2:
RESEARCH EVALUATION
Evaluating the economic
and social impacts of
applied forestry research.**

RESEARCH APPROACH

values people place on forests, increasing our emphasis on ethnic groups and recreation interest groups. And, we will expand our focus to include people's use of National Forests as well as urban forests. We also plan to study the role of tourism in rural economic development and to develop new ways to increase communication between forest managers and users. Our fire researchers will begin to develop methods to assess and manage the fire hazards in the wildland/urban interface - an area where combustible homes meet combustible vegetation. And, our wildlife biologists will determine the trends in society's views toward wildlife and their implications on goals set by wildlife manager.

New technologies resulting from successful research and technology transfer have had tremendous social, economic, and environmental impacts. But, managers of forestry research organizations often initiate and redirect research programs with less than perfect vision about what social and economic impact the research will have. Methods to evaluate the impact of forestry research have simply not been available. Our research in this area seeks to determine the value of forestry research.

Current - To date, research evaluations have focused mainly on the economic impacts of commodity research. Several methods for estimating rates of return to investment in forestry research have been developed and tested. In addition to economic impacts, the social and environmental impacts of forestry research are equally important.

Future - In the 1990's, we will seek answers to research questions such as - How is community stability influenced by new forest management practices and technology? How does the adoption of new technology affect employment? Does newly applied forestry research create more or less biological diversity in an ecosystem? This new focus will enable us to develop methods for evaluating the value of noncommodity research. The results will profoundly affect the forestry research community as a whole and will give decision makers another tool with which to make more informed choices.

Understanding Resource Options



Research Thrust 1: INVENTORY AND ANALYSIS Measuring and evaluating our region's changing forest resources.

RESEARCH APPROACH

This area of research will blend our knowledge of ecosystems and people/environment relationships to determine how management affects ecosystem productivity. More than ever, forest managers need to know how one management action affects a broad array of forest resources and values. We will develop new decision support systems for forest managers, incorporating our most recent research results.

Research will be conducted on all the different forest resources as well as in important areas such as forest inventory and analysis, environmentally sensitive harvesting systems, stand dynamics, and the economics of long-term forest management. Our researchers from different disciplines will work together closely to produce information that will truly assist forest managers with integrated resource management.

Inventory and analysis of the Nation's forest resources provide information required by law and used by many. State and regional economic planning groups use the inventory data to plan resource policy. Forest industries use the data to make development decisions and to locate sources of raw material. Environmental groups use inventory data to evaluate potential actions recommended for forest land. Scientists and academicians rely on this information for research studies, and foresters use it in developing management plans. Forest inventory data are also a critical part of the national assessments mandated by the Forest and Rangeland Renewable Resources Planning Act of 1974 (RPA) - the plan that provides direction for all Forest Service programs.

Current - Forest Service Research is the only organization that conducts comprehensive, periodic inventory and analysis of the Nation's forest resources. Inventory and analysis is a key element of our Station's research program, as we evaluate resources in 11 North Central States. Station field crews collect data on the extent, condition, and use of the forest land. Our resource specialists analyze the data, studying trends in forest conditions and use to find answers to major natural resource issues and concerns. We also develop analytical models to clarify options for forest management, identify efficient forest investment decisions, estimate demands on the resource base, and evaluate public programs and policies for the region.

Future - We will maintain a strong forest inventory and analysis program, working closely with State foresters, Northeastern Area State and Private Forestry, forest industry, and other interested groups to meet their changing information needs. As in the past, we also analyze special resource issues and concerns. Special analyses planned for the 1990's include a multi-resource assessment of the forest resources in the Lake States, an assessment of changes in wildlife habitat, and an

**Research Thrust 2:
SUSTAINING
PRODUCTIVITY
Identifying influences on
forest productivity.**

RESEARCH APPROACH

evaluation of the potential use of wood biomass for energy production and its effect on established forest products industries. We also plan to predict future supply of selected tree species in the Lake States and in the Central States.

Foresters are concerned about the effect of forest management activities on the capability of the land to yield products and other benefits on a sustained basis. How does harvesting impact soil, water, and aesthetics? What are we doing to the nutrient supply for our next forest when we remove whole trees - leaves and all? What is the potential for expanding markets and uses for forest resources? How does species composition change when we move from uneven- to even-age management? And, how can we improve forest nursery production and seedling quality?

Current - Increasing forest productivity is a key element of many of North Central's research programs. Our silviculture research focuses on tree growth, genetics, regeneration, and the influence of various silvicultural practices on forests. We look for alternative methods of sustaining productivity such as short-rotation intensive culture plantations. And we continue to study the most effective means of controlling forest insects and diseases to protect forests, Christmas tree plantations, and nurseries. Our harvesting engineers are developing systems to aid in timber harvest and transportation planning, designing environmentally sensitive harvesting equipment, and developing alternative wood products and the machines to produce them.

Future - Future research will focus on the effects of forest management on the ecosystem as a whole, including soil, water, fish, wildlife, and aesthetics. Our work will also extend to the effects of vegetative management on wood properties and product quality of high-value hardwoods. Future research will also be concerned with the relation between the ecosystem and forest productivity. And we will increase our focus on such things as below ground ecology and its influence on vegetative growth. In another new area of research we will combine biological knowledge with economic facts and theory to determine the potential profits and risks of long-term forest management for multiple benefits. Using the results of all this research, we will produce guidelines to help resource managers meet increasing demands for timber and noncommodity benefits, while maintaining and improving long-term productivity of the land.

**Research Thrust 3:
INTEGRATING
RESOURCE USES
Developing principles to
guide management of
forests for diverse values.**

"The days have ended when the forest may be viewed only as trees, and trees viewed only as timber. The soil and the water, the grasses and the shrubs, the fish and the wildlife, and the beauty that is the forest must become integral parts of resource managers' thinking and actions."

With these words, Hubert H. Humphrey described how human population growth and societal changes were making demands on forest lands as never seen before. The challenge to land managers today is to meet society's demand for new and more diverse uses of the forest, while still satisfying the needs of our more "traditional" users and activities.

Every time we manage for one resource use we affect the other uses. The wisest land management decisions are made with a full understanding of how proposed actions will affect all resource uses. Often there will be tradeoffs between one resource use and another but benefits from different resources are usually not mutually exclusive. A harvested forest will provide different wildlife habitat than it did before, helping some species and harming others. A road built for timber harvest will provide access for recreation but will eliminate some opportunities for solitude.

Forest managers need better information and improved models to help them understand the tradeoffs between resource uses. They need to know how management actions for one goal affect the broad array of values derived from all uses of the forest.

RESEARCH APPROACH

Current - To serve that need, our research program is providing land managers with better integrated information and improved ways to integrate diverse goals - helping them set priorities while understanding the tradeoffs. This often means synthesizing existing research results and packaging them in such publications as the Northern Hardwood Notes, the Central Hardwood Notes, and the Walnut Notes. But it also means conducting research that considers the effects of cultural treatments on many resources to produce integrated results. This research is giving managers ways to quantify the response of a forest system - timber, wildlife, water, and aesthetics - under specific conditions, both managed and natural.

Future - Realizing that the value of information lies in its organization and accessibility, we will step up development of forest management decision support systems that evaluate, manage, and use the mass of data and knowledge about resources and users. Many of our research products will continue to be based in high technology such as computer-based decision models, artificial intelligence, and applications of geographic information systems. As land managers of tomorrow practice integrated resource management, these tools will be essential for making sound and comprehensive forest management decisions.

LOOKING AHEAD

On the basis of our Station's mission and goals, our strengths, and the influence of the environmental community, we have outlined a framework for our research in the 1990's. To carry out our mission, we must have a solid funding base. This means we must aggressively seek outside sources of funding to supplement our appropriations. We also must seek more partners interested in our research goals. The global orientation of our program calls for more international partners in the 1990's. Cooperative ventures will strengthen our research program, our facilities, equipment, and our work force.

The 1990's will bring greater demands on natural resources and more complicated problems. We will foster our relationship with the scientific and environmental communities to ensure that we focus on the highest priority problems.

Highly skilled, creative, and motivated people are needed at North Central Station to carry out our mission. We are committed to creating a work environment that nurtures innovation, motivation, team spirit, purpose, challenge, and excitement. We will aggressively recruit and work to retain a culturally diverse work force of top-notch people.

The reason we exist as an organization is to do quality science. This plan guides us in that purpose. Our success in implementing it depends on the contribution of each Station employee. With a clear vision of our mission and our focus for the future, and with creativity, flexibility, and an entrepreneurial spirit, we greet the 1990's with optimism.

*"Instead of worrying
about the future, let
us labor to create it."*

Hubert H. Humphrey

